# Process and device for coding images according to the MPEG standard for the insetting of imagettes

This application claims the benefit under 35 U.S.C. § 365 of International Application PCT/EP99/09025, filed November 11, 1999, which was published in accordance with PCT Article 21(2) on June 2, 2000 in English, and which claims the benefit of French Application No. 98/14851, filed on November 25, 1998.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The invention relates to an image coding process for the insetting of an imagette into an image coded according to the MPEG standard.

### 2. Description of Prior Art

Until the last few years, the images produced were generally transmitted and exchanged between television signal broadcasting operators in uncompressed form, that is to say in clear.

When it was necessary to adapt a source programme, the processing of the images was carried out on the basis of professional hardware. For example, when a director needed to utilize a report from a concurrent channel, he could readily, with the aid of a mixer, insert his own logo, information such as subtitles, the score of a match, etc. without additional equipment.

Now that the broadcasting and exchanging of data are performed in the form of compressed data, for example according to the MPEG standard, the insetting techniques require additional hardware: a decoder for bringing the compressed images into baseband at the input of the mixer, a coder for re-encoding the sequences after they have been modified. Moreover, to perform a re-encoding of better quality, it may be necessary to implement a decoder/coder pair which is aware of how to manage assistance information which is added to

the coded signal and passes through all the studio equipment before reaching the re-encoder, thereby making the system complex.

## SUMMARY OF THE INVENTION

The purpose of the invention is to alleviate the aforesaid drawbacks.

Its subject is a process for coding images according to the MPEG standard, for the insetting of at least one imagette into an image, utilizing the inter mode with motion estimation with respect to a reference image and the intra mode, characterized in that:

- an exclusion zone which includes the macroblocks which lie even partially in the location of the imagette is defined in the image,
- the motion estimation of the macroblocks of the image not belonging to the exclusion zone cannot take account of an image block belonging to the exclusion zone in the reference image.

According to a particular mode of implementation, the inter mode for the coding of the macroblocks of the image belonging to an exclusion zone is an inter mode with null motion vectors.

According to a particular mode of implementation, the intra mode is forced for the coding of the macroblocks of the image belonging to an exclusion zone.

According to a particular mode of implementation, it carries out a marking of the macroblocks of the reference image belonging to the exclusion zone.

According to a particular mode of implementation, the marking consists in performing a transcoding of the luminance values of the macroblocks by decrementing the values equal to the maximum coding value and then by forcing the luminance values of the macroblocks belonging to the exclusion zone to this maximum value.

According to a particular mode of implementation, for a given row of macroblocks, the coding allocates a specific slice for the macroblocks belonging to an exclusion zone.

The invention also relates to a process for inserting an imagette into an image coded according to the process described above, characterized in that the macroblocks of an intra-coded slice are replaced by macroblocks relating to the imagette.

According to a particular mode of implementation, the replacement consists of a recovery of the intra-coded macroblocks corresponding to the exclusion zones, a baseband decoding of these macroblocks, a mixing with the imagette to be inset into the exclusion zone, a coding of the image obtained so as to provide the replacement macroblocks.

According to a particular mode of implementation, the quantization interval for the coding of the macroblocks belonging to the exclusion zone is a function of the cost coding the macroblocks to be inserted.

The invention also relates to a device for coding digital video data according to the MPEG standard for the insetting of at least one imagette into an image, comprising a subtractor receiving on a first input an intra macroblock and on a second input a predicted macroblock to be subtracted from the intra macroblock so as to provide an inter macroblock, a circuit for selecting an inter or intra mode receiving the corresponding intra macroblock or inter macroblock for selecting one of the macroblocks according to an energy criterion, a circuit for transforming and quantizing the macroblock selected so as to provide a macroblock of quantized coefficients, a circuit for the variable-length coding of the macroblock of quantized coefficients and a buffer memory for providing a data stream at the output of the coding device, an inverse quantization and inverse transformation circuit for obtaining a macroblock reconstituted from the macroblock of quantized coefficients, an adder of the reconstituted macroblock to the predicted macroblock so as to provide a reconstructed macroblock, a memory and predictor for storing the reconstructed macroblock and providing a reconstructed image, a motion estimator receiving the intra macroblock and the reconstructed macroblocks so as to provide a motion vector (MV) for the memory and predictor so as to calculate the predicted block, a regulating circuit receiving information from the buffer memory so as to set a quantization interval for the transform and quantization circuit, characterized in that:

BRIEF DESCRIPTION OF THE DRAWINGS



- the selection circuit and the motion estimation circuit receive an information item pertaining to an exclusion zone (ZE) which includes the macroblocks lying, even partially, in the location of the imagette,

- the selection circuit forces the intra-coding of the macroblocks belonging to this exclusion zone,

- the motion estimation circuit calculates the motion vectors while eliminating the motion vectors pointing from the blocks of the reconstructed image belonging to the exclusion zone.

DETAILED DESCRIPTION

According to a particular embodiment, the device is characterized in that the regulating circuit receives the information item defining an exclusion zone so as to adapt the quantization interval of the transform and quantization circuit for the macroblocks in this exclusion zone.

The principle of the invention consists in defining exclusion zones in the image, the coding of the image not belonging to the zones being performed independently of these zones, a motion vector pointing at an exclusion zone not being, as the case may be, taken into account. The insetting of an imagette into an image sequence can be carried out in a simple manner while limiting the decoding of the image to a predetermined zone.

The main advantage of the invention is that it avoids the use of complex and expensive equipment, namely professional decoders and coders. This is all the more true since the formats used, such as the high-definition television format or HDTV, require the utilization of complex equipment.

The decoding and coding of the image are either simply eliminated if the insertion is carried out at the level of the MPEG data stream, or limited to zones of the image which are coded in intra mode when working in baseband, allowing decoding and recoding of these zones by software not requiring any motion estimator and other complex decoding circuits.

## BRIEF DESCRIPTION OF THE DRAWINGS

Other characteristics and advantages of the present invention will become more apparent from the following description given by way of example and with reference to the appended figures, in which:

- Figure 1 represents an exclusion zone in a reference image,

- Figure 2 represents a prohibited position of a predicted macroblock in the search window of the reference image,

- Figure 3 represents a coding device according to the invention,

- Figure 4 represents a motion estimator used by the coding device according to the invention.

## DETAILED DESCRIPTION

In image coding systems with motion compensation such as the systems complying with the MPEG standard, the search for a motion vector in respect of a given image block is carried out with respect to a reference image previously processed and transmitted to the decoder.

Figure 1 shows a first image 1, called the source image, and a second image 2, called the reference image, from which the source image is coded. The coding of an image block 3 of the source image is performed by carrying out a correlation of this block with blocks of the same dimension which are contained in a search window in the reference image so as to determine a reference block which gives the best correlation. The coding then corresponds to a block of residuals. This block is obtained by luminance and chrominance differencing between the block of the source image and the reference block so as to provide a difference block, then by discrete cosine transformation of this difference block so as to provide a block of coefficients which is the block of residuals. The reference block is defined by a motion vector representing the displacement of the current block with respect to this reference block. The components of the motion vector are transmitted, together with the compressed data, in the MPEG data stream.

The size of the source images and of the reference images being identical, a vector can point towards any zone contained in the reference image.

The coding process according to the invention utilizes a motion estimation excluding the motion vectors pointing into one or more zones declared prohibited and corresponding to the imagettes to be inset or mixed.